Use of Xenon in combination with Isoflurane for general anaesthesia in adults: Prospective randomized clinical trial

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The aim: to investigate the effects of anesthesia with xenon-Isolflurane combination

Background

Xenon

- ❑ Favourable intraoperative haemodynamic profile[8]
- ❑ Neuroprotective properties without co-existing neurotoxicity[4,7]
- ❑ Fast onset of action and rapid recovery with good satisfaction[1]
- ❑ Insufficient analgetic, myoplegic properties to be used alone in most patients[6]
- ❑ High cost

Isoflurane

- ❑ Is commonly used for general anesthesia.
- ❑ My significantly alter global hemodynamic parameters[9]

Xenon + Isoflurane

- ❑ Xenon interacts additively with isoflurane and sevoflurane on MAC-awake[3]
- ❑ Different synaptic actions[2]
- ❑ Xenon mitigates isoflurane-induced neuronal apoptosis in the developing rodent brain[5]

❑ **Limited clinical experience and shortage of available clinical data of concomitant use of Xe and isoflurane**

Methods

For maintenance and control of Xenon anaesthesia we used a closed-circuit anaesthesia system (*AxeomaTM, Alfa-Impex Oy, Finland*) designed for us of all modern inhaled anesthetic agents and xenon.

Patient characteristics and intraoperative data (M±SD, Me (LQ;UQ))

	Xe	Xe+Iso	Iso
Number of patients	56	57	55
Age (yr)	59± 13	60 ± 11	59 ± 10
Among them, older 70 yr	8	8	9
ASA I/II / III	4/40/12	5/39/13	3/41/11
Duration of surgery, min	124±23	127± 27	127± 30
Fentanyl dose, mg	0.54 ± 0,15	0.34 ± 0,07 (p<0.01)	0.50± 0.18
Xe consumption, l	12 (11;13)	8 (7;9) (p<0.001)	0

Premedication: 1 hour before surgery – diazepam 10mg i.m.

Induction: propofol – 1,5 mg/kg; fentanil 2,5 – 3,5 μg/kg; rocuronium – 6 mg/kg: intubation of trachea and mechanical ventilation in normoventilation mode

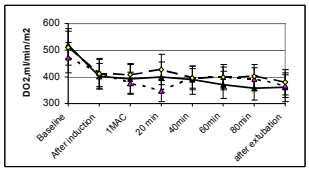
Anaesthesia maintenance in Xe group: After denitrogenation the empty bellows was filled with xenon (3-4 L/min.) and in 1 min the FiXe was 30-32%. At this initial filling of the breathing circuit no xenon was lost to the scavenging. Xe was continued with 0.2-0.25 L/min. and after 6-8 min the FiXe was 60-65 vol%. Later the target vol% of FeXe 0.60-0.65 and FeO_2 - 0.25 was maintained. Additional bolus injections of fentanyl were used according to clinical needs. Xe delivery was stopped at the end of surgery and patients were extubated by hospital protocol.

"Xe+Iso" group: To reach and maintain the target Xe concen. (35%, 0.5-0.6 MAC) the technique of previous group was applied and isoflurane was delivered with target concen. of 0.4 - 0.5 MAC. At 15 min before end of surgery Isoflurane delivery was discontinued and at the end of surgery Xe was turned off, and patients were extubated by hospital protocol.

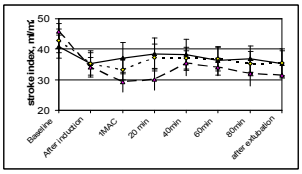
Iso group: General anaesthesia was achieved with traditional low-flow method with isoflurane concentration equal to 1.0 MAC, with FiO_2 – 0,5 and FGF – 0,5 l/min.

Results

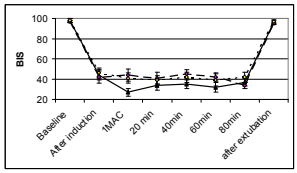
No differences in oxygen delivery



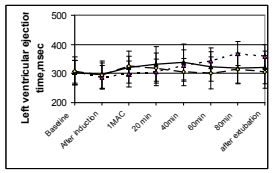
"Xe+Iso", compared with "Iso", reduced risk of cardiovascular depression



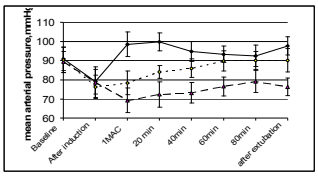
BIS – index: safety levels in all groups



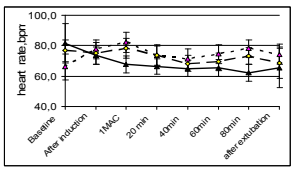
Xe and "Xe+Iso" did not alter myocardial contraction time



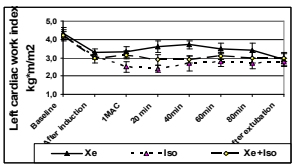
"Xe+Iso" reduced the risk of hypo- or hypertension, compared with "Iso" and "Xe



"Xe+Iso" did not induce bradycardia, as "Xe" alone



"Xe+Iso" did not increased left ventricular afterload, as Xe alone

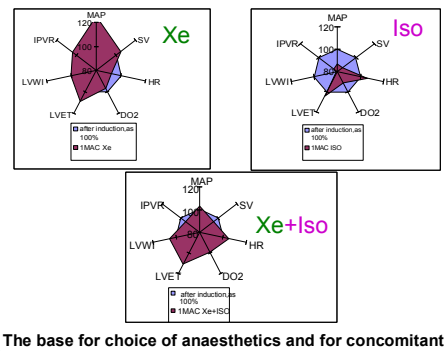


No important differences between groups in the 1-st day after surgery

	Xe	Xe+Iso	Iso
Time to eyes opening, min	2.7± 2.1	2.5± 2.0	6.2± 3.4 (p<0.05)
Time to extubation, min	14 (11;16)	15 (11;16)	14 (12;16)
Postoperative nausea,%	18.1	16.1	21.1 (p=0.966;0.661)
Postoperative vomit,%	0	0	1
"sleepiness", %	29.1	35.7	47.4 (p=0.07;0.28)

Discussion

Xe and Isoflurane: different haemodynamic profiles



The base for choice of anaesthetics and for concomitant use?

Conclusions

Use of Xenon in combination with Isoflurane for general anaesthesia can be as safe and effective like xenon and isoflurane separately. Xenon consumption is reduced without compromising cardiovascular benefits and the high quality of early postoperative period.

References

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